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App. No.: 09/922,062
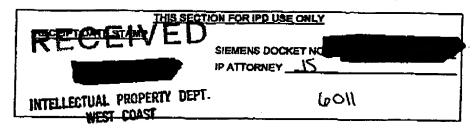
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EXHIBIT A

INVENTION (INV) DISCLOSUI

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DEPARTMENT (IPD)
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1. TITLE : **A subsystem for device and
media-sensitive access and processing of multimedia messages**

2. PURPOSE AND PROBABLE FIELD OF USE OF THE INVENTION: **To provide a subscriber or a user of a unified messaging mailbox with efficient and intelligent methods that are media and device sensitive in order to access and process (e.g., read, listen, forward, and search) messages.**

3. PLANNED USE IN PRODUCTS; USE OUTSIDE COMPANY, DEMONSTRATION, DISCLOSURE, OR PUBLICATION OF THE INVENTION (GIVE DATES): Integration into messaging, mobility, and collaboration products, including Xpressions; stand-alone application clients and virtual assistant applications.

4. LIST ALL WRITTEN DESCRIPTIONS OF THE INVENTION (E.G. DESCRIBED IN ENGINEERING NOTEBOOK NO. ___ PGS. _____): See Invention Disclosure Form Supplement attached.

5. DATE(S) INVENTION. WAS CONCEIVED ▓▓▓▓ DATE(S) INVENTION WAS EXPLAINED TO WITNESS(ES) ▓▓▓▓
   DATE(S) EMBODIMENT(S) OF THE INVENTION WAS CONSTRUCTED ▓▓▓▓
   DATE(S) EMBODIMENT(S) OF THE INVENTION WAS TESTED: None

6. ATTACHED IS A DETAILED DESCRIPTION COMPRISING __1__ PAGES

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10. DID ANY WORK CONCERNING THE INVENTION ARISE IN THE COURSE OF ANY CONTRACT? **No** IF YES, IDENTIFY:

11. WAS ANY WORK CONCERNING THE INVENTION DONE IN THE COURSE OF OR UNDER ANY GOVERNMENT CONTRACT OR SUBCONTRACT? **No** IF YES, IDENTIFY:

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Invention Disclosure Form Supplement

1.   NAMES

Christoph A. Aktas, John W. Yates, Phillip C. Meredith

2.   TITLE

A subsystem for device and media sensitive access and processing of multimedia messages

3.   PURPOSE AND PROBABLE FIELD OF USE OF THE INVENTION

The purpose of this invention is to provide a subscriber or a user of a unified messaging mailbox with efficient, intelligent, media- and device- sensitive methods to access and process (e.g., read, listen, forward, and search) messages. The invention introduces information summarization and media conversion capabilities to selectively treat multi-media messages and message attachments so that they can be efficiently handled by mobile devices like PDAs (Personal Digital Assistants), pagers, or phone devices (with or without a text display feature). Furthermore, the invention introduces message content analysis capabilities that will recognize linguistic relationships between messages regardless of the media type. The invention also describes the ability to present these linguistic relationships as a "graph" along with the standard messaging relationships (Message arrival time, subject, sender, etc.) And, finally, the invention also introduces a message referencing option that allows simpler message selection from certain devices.

4.   PLANNED USE IN PRODUCTS

The system could be potentially integrated in all our messaging, mobility, and collaboration related products including Xpressions. Specific clients could be developed as separate products and work with any existing messaging system. The capabilities could also be integrated into call center-based e-mail communication systems for interaction with customers. New virtual agent products could utilize these capabilities.

5.   ABSTRACT

This invention describes capabilities that will, especially when used in coordination with each other and existing capabilities, increase the efficiency of unified mailbox users. Media conversion, information summarization, sophisticated data relationship identification, data relationship presentation and message selection tools are described that allow the unified mailbox user organized and efficient access to his/her messages, customized to the device they are using. With these capabilities, the problems of overwhelming amounts of data in a variety of media (often incompatible with the user's current display device) will be reduced.

6.   BACKGROUND INFORMATION

6.1   What is the problem solved by your invention?

Witness: *Elizabeth Hanell*

Date: ....

A unified mailbox where all kinds of media (voice, fax, e-mail, and video) are made accessible and/or visible from virtually anywhere to a subscriber or user in one basket is a convenient means of communication when compared to handling multiple mailboxes with distinct media. Current solutions for a unified mailbox are inefficient, however, for someone with an intense communication style and a frequent need to handle his/her messages remotely. The mismatch of media type of the information and the capabilities of the various (often limited) devices used for remote access places a heavy burden on the user and the interface of the system. This is especially true for the interfaces utilizing a telephone with no display, or handheld devices with limited display capabilities.

Some of the problems arise in the context of compound and/or lengthy messages in connection with one or the other access means. For examples:

- How to handle voice and fax attachments from a text-only e-mail capable device?
- How to treat lengthy e-mails from a voice-only interface or text-interface with limited capabilities. Even when the device has a fully functional GUI interface, there is room for increased efficiency with large amounts of data.
- How to efficiently present the information in various office document formats (e.g., Word Processor, Spreadsheet, and Presentations) associated with a message.
- How to locate and visually present related messages and attachments?
- How to easily reference messages in the message store?

Other problems arise due to the increased amount of information the unified mailbox can provide. Current mechanisms for organizing and presenting relationships among messages (listing by arrival time, subject, sender, etc.) are insufficient for a large number of messages of varying media (and, especially, mixed media within a given message). The user requires a flexible, media independent way of finding and navigating related messages. With current systems, for example, the user is unable to recognize that there is a relationship between a voice message and a fax without listening to the message and displaying/printing the fax. This invention proposes that the system convert these messages to text, analyze the results and present any relationships discovered.

Finally, because the presentation of unified mailbox information is more complex, especially if relationships as described in the previous paragraph are incorporated into the presentation, identifying an individual item (message or message attachment) for further action can become problematic. How does the client/user identify to the server which message is to be acted upon? Are the entire message and its attachments to be involved? Is it a single attachment or only the original message body? And if the messages are presented in a "graph" format, how does the user select an individual item? This invention also addresses this problem.

6.2   *What techniques prior to your invention were used to perform the function of your invention?*

Current technology that attempts to address these problems varies depending on the user's device:

1. Current systems offer media sensitivity for message retrieval when provided with a graphical user interface (GUI) from a PC client or Web. If a particular media or office document is attached to an e-mail, the user needs to click-on it in order to launch a specific client (for instance: audio player for voice, tiff-viewer for fax, video player to view a video message,

Witness: ...~~Elizabeth Herell~~......
Date: ... █████████████ ....

Word to a view or print MS-Word document) to listen, to view, or to print the document.

For users with intense communication requirements (e.g. executives or customer service agents who receive hundreds of compound messages daily) there are no means to quickly process/read Inbox messages except by the sender information, the subject line, and maybe few lines of the message body. In order to read messages, the user has to click on or mark a certain item in a graphical interface in order to get to the message body.

No content summarization of lengthy text messages or respective attachments is available yet that would remarkably improve the efficiency of handling the daily information avalanche in the office.

Search is provided in certain clients on e-mail only, but it does not provide visual display of content and temporal relationships. No search capability exists yet for non-text messages.

No powerful message referencing capabilities are offered to efficiently handle multimedia messages from remote devices (e.g. telephone).

2. If a unified mailbox is accessed from a telephone interface, voice and e-mail messages are retrievable and the user can listen to both; here, text-to-speech technology provides a means to convert the e-mail to voice. A fax message can be forwarded to a fax machine or printer. However, if an e-mail contains a voice attachment, the systems are able to indicate that, but are unable to access its content. Similarly, the contents of a fax or other documents attached to an e-mail are indicated but not accessible to the user using the telephone interface.

    If an e-mail is lengthy, based on the interface provided, the user maybe able navigate through it buy accelerating its reading, skipping parts etc. in order to listen to it completely. There is no means of text content summarization applied to shorten the process without eventually losing/skipping critical content.

3. If messages are forwarded to a handheld device via a wireless service but the device has limited text-display capabilities only certain parts of the email (*From, Subject* and a limited number of characters of the message body) can be displayed.

    If the critical information in the message is not in the beginning of the message body that is displayed, it is "lost" to the recipient. He/she has to use other access methods (like Web) or make a call into the messaging system/server to retrieve the full text message (by listening to it or by initiating a printing to fax device nearby).

    Importantly, voice and other media attachments are indicated but not transmitted and/or displayed on a text-only display. The user needs to use other access methods (Web and/or Telephone) to retrieve the messages. Additionally, no text content summarization methods are utilized to deal with access device technology limitations.

6.3   *What are the disadvantages of these prior techniques?*

Full message sensitivity is provided within a GUI-only (desktop PC client or Web). However even GUI interfaces lack any means to summarize message content in order to make it more efficient to the recipient to read his/her lengthy messages. Also, there are yet no means to summarize content of attached documents.

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Within the telephony interface, the media and device sensitivity is limited to voice and e-mail. Again, no techniques of text content summarization are applied yet in order to make the retrieval of the message information over the phone more convenient.

In case of handheld or mobile devices with limited text-display capabilities, the problem is that lengthy messages are not transmitted usually by the wireless/paging service providers. Additionally, any other media attachments are "lost".
No content summarization of lengthy text messages or respective attachments is available yet that would remarkably improve the efficiency of handling the daily information avalanche in the office.

Search is provided in certain clients on e-mail only, but it does not provide visual display of content and temporal relationships. No search capability exists yet for non-text messages.

No powerful message referencing capabilities are offered to efficiently handle multimedia messages from remote devices (e.g. telephone).

6.4   What are the advantages of your invention over the prior techniques?

The proposed invention solves the problems above by utilizing advanced media conversion methods, analysis and summarization of message content, and intelligent forwarding concepts. Principally it provides access device and media sensitive intelligence for a mailbox when retrieving or forwarding a particular message.

The proposed techniques provide the following advantages:

a) *Advanced media conversion* - the concept of media conversion is extended beyond text-to-speech to other attachments; a speaker-independent, large vocabulary, telephony-quality speech recognition engine is utilized to convert a voice message to text or to convert the voice track of a video attachment into readable text. Similarly, fax information is converted into text. Use of this feature will allow users on devices unable to handle the original media type of a message to present the message to the user.

b) *Content summarization provides increased efficiency in message handling* – the summarization of a message content is an improvement toward efficiency, even in a GUI environment. In a GUI environment, lets say in Microsoft Outlook, the user could point to the item in the in-box to have displayed in small pop-up box the summary of that message. But its benefits are obvious in case of a forwarded lengthy message to a handheld device with limited display capabilities. The same is true for reading a message over the phone. Summarization applied to attached media (e.g. fax, Word document) extends even the media content accessible.

c) *Media and device sensitivity* - Both, the media conversion and the content summarization applied together provide compatibility with the access device. Depending on the user, the types of potential access devices are usually predefined; therefore messages along with their attachments that form the message content can be tailored to those devices while accessed or forwarded according to a profile. This ensures the availability of more information to the recipient at the device of choice and that is probably most convenient. Still, if the user requires more information, he/she can utilize another access method (telephone or Web).

Witness: *Elizabeth Henell*

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d) *Cross-Media Search and Visual Display* – Often messages related to a specific topic of interest to the user are in different media and spread throughout the message store (e.g. different folders). The cross-media search would find these messages and present them to the user in a way that makes the content and time relationships clear – allowing efficient use of the otherwise overwhelming amount of information. Ultimately, the search can utilize sophisticated linguistically based analysis tools to discover the message relationships.

e) *Simpler Message Referencing* – Additionally, a reference number scheme to messages is proposed. All messages in a particular group of messages of interest to the user would be assigned a reference number to be used in further actions. Thus a PDA user can, for example, get a summary of messages with reference numbers and an indication of the message type. This reference number could then be used to access that message, and through it, a particular attachment of that message for further action (Print the first attachment of message 7 to fax; play message 6 on telephone). Ultimately, voice commands could be used to invoke actions on items more efficiently ("Fax item 12345 to my hotel")

f) *Combinations of the above features* – Powerful user interface functions can be built from these features. The sample scenario below shows one possibility. Many others are possible.

7.   DETAILED DESCRIPTION

7.1   *Detailed structural and functional operation*

The basic structural components required for the proposed features are:

- A multimedia PC with a client program that provides a multimedia message inbox. Alternatively, a server that provides multimedia message inbox for several users on a network.
- A subsystem that detects media attachments in messages in a mailbox.
- A subsystem that converts media attachments into another media type using text-to-speech, fax-to-text, video voice track into text and ultimately speech-to-text
- A subsystem that analyzes and summarizes text content of original or converted media in respect of the linguistic meaning
- A subsystem that pushes appropriate media according to an access device and message purpose, as defined in a profile
- A subsystem that identifies cross-media interrelationships between messages and controls the media conversions necessary for this analysis.
- A subsystem that controls the reference scheme.

Sample Scenario: Notification of a Single-Media Voice Message to a Data Pager

The following describes an example of this process involving a user that has a multimedia mailbox and a data pager who receives a Voice Message. The problem is to provide the "best" information to the pager so the user can proceed most efficiently. What is the "best" information will vary according to the user's actual preferences, but will most likely include sender identification and meaningful portions of the message itself. In addition, there are probably messages the user would prefer to delay any handling of until an appropriate device is available. Thus the steps would include: a) filtering messages to be processed, b) speech-to-text conversion, c) summarization and post filtering, and d) selection and delivery of this information to the device.

Witness: ...*Elizabeth Heavell*......

Date: ...███████████.....

Pre-Filtering

As the resources involved in processing a message may be large. Speech-to-Text is "expensive" in its use of resources. Interrupting the user with all but the most important messages can be an unnecessary expense of the user's time and attention. Thus a mechanism to prevent the presentation of a message to a given device is important. This filtering is currently available on products like Microsoft Exchange/Outlook that can filter based on a variety of data including sender, message priority, etc.

Speech-To-Text Conversion

With a speaker/microphone independent speech-to-text engine, the selected Voice Message then can be converted to text[1]. This would be most efficiently accomplished on the server side, perhaps with a dedicated "helper" server explicitly for the server so as not to disturb other processing on the server. The resulting text message would then be associated with the original message (as the text message body or as a separate attachment). ·

Post-Conversion Filtering and Summarization

Another filtering step might then be appropriate, preventing processing of messages that appear not to be on a topic deemed important to the user. If it does not appear important, it would then remain in the mailbox to be processed.

If the message survives the filtering step, the text would then be summarized. Most simply, summarization would include reduction to a list of keywords and phrases found within the text. The summarization would be created by removing from the message words/phrases not found within the user-defined list of keywords/phrases. More complex summarization would include allowing the user to specify the keyword/phrase list based on the sender of the message[2]. The most complex summarization method would involve sophisticated grammatical parsing and analysis.

Data Selection

For notification via data pager, the user would configure what part of the filtered summarized message they wish to be sent. The data available for selection would include Sender Name, Time, Summary, Message Priority and un-summarized Text (and other fields as available). The user would describe a template that indicates the information desired and the number of characters of each field desired. For example[3]:

```
From %SENDER% at %TIME%: %100SUMMARY%
```

Would indicate the user wants a string that includes the entire sender name, the received time and the first 100 characters of the summary to appear on his pager.

When the user receives the page, the summary information should give him/her enough information to determine how critical the message is. If it appears critical, he/she could get to a more appropriate device (e.g. a telephone) and listen to the full message.

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[1] Interim solutions for non-speaker/microphone independent engines will be discussed in a separate document (maybe in section 7.2).

[2] Since the message will be a speech-to-text conversion, the keywords AND THEIR HOMONYMS should be checked. An option on the summarization, like a check box that says "Allow homonyms" would seem the best way to handle this.

[3] The exact template format is to be determined; this is just to describe the concept.

Witness: *Elizabeth Howell*

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7.2   *Are there alternative methods or different structural embodiments of your invention? Can the general idea or technique of your invention be extended to other related fields?*

a) The summarization concept can be applied in context of any other handheld device that is not limited to text only (e.g. Windows and Windows/CE devices)
b) A morphing process for a certain message in context of any particular target device can be defined. The morphing process would be a combination of message filtering, message restructuring, data conversion, data summarization, data selection and notification steps that are configured to handle particular media types for particular target devices. Each user could define a set of rules and parameters for each device type defined would determine how the message is morphed. For example, a user could have a Voice Message-to-Pager morph definition that would do the following:

1. Filter based on sender and priority, removing from further processing (i.e. leaving on the server) message that are not deemed urgent enough to disturb the user while out of the office.
2. The message would go through speech-to-text conversion and the resulting text stored back in the message.
3. The text would be summarized based on criteria defined by the user.
4. Another Filtering step, based on the summarized/converted text would then weed out items whose content makes them less urgent.
5. Data fields from the message (like sender, priority, summary and text) are selected and a notification message created.
6. The message is sent to the pager as a notification.

In general, a morphing process will include these steps in some order determined by the user. In addition, message restructuring steps would allow the user to handle multiple attachments of varying media on the message. For example, the user could select that a summary of the attachments be created (attachment name and media type) - or could request that the attachments be expanded, converted and summarized as described for the single media message above.

Examples
- Voice Message to Data Pager (as I described already)
- Text Message to Phone
    1. A Filter out unwanted messages based on sender and priority.
    2. Summarize message to reduce its size.
    3. Convert text-to-speech.
    4. Play the converted message over the phone.

- Fax-to-PDA
    1. Filter out unwanted messages based on sender and priority.
    2. Convert fax-to-text.
    3. Summarize.
    4. Select Data Fields
    5. Send the summary to the PDA and "Notify" the user.

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7.3   Which features are believed to be new?

- Conversion of media applied to any media (voice, fax, video) in a mailbox
- Text summarization of original or converted media from a multimedia mailbox
- Improved efficiency even in a graphical environment by summarizing the content of a message according to its linguistic meaning
- Media and device sensitivity when accessing multimedia messages in a message inbox
- Linguistically based search for relationships between message/message attachments of differing media types.
- Integration of these capabilities into useful features for the mailbox user.

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Date: ....